

THE NEARCTIC SPECIES OF THE GENUS EURYGASTER

(Hemiptera: Pentatomidae: Scutellerinae)

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In the course of investigating the ecology of some endemic California *Eurygaster*, the problem of identification of species arose. Seven specific names existed and were dealt with by Bliven (1956) in a key. It was obvious when attempting to use this key that the characters employed were too variable. Also there were some additional characters used by Bliven in describing his five new species. Therefore, the present taxonomic study became necessary to attempt to clarify at least Bliven's species and to shed light on the systematics of Nearctic species of the genus *Eurygaster*.

The first species of North American *Eurygaster* to be described was *E. alternata* by Thomas Say in 1828. Van Duzee described *E. carinata* in 1904, but this name was changed by Kirkaldy in 1909 to *E. shoshone* since Van Duzee's specific name was a primary homonym. Many locality records were published by Van Duzee (1917) for these two species in North America mainly involving the distribution in the western States.

In 1956 the latest and last systematic work to be published on Nearctic *Eurygaster* was Bliven's descriptions of five new species: *E. greggii*; *E. ukiah*; *E. macclellani*; *E. amerinda* and *E. minidoka*. All of the specimens he studied were collected in northern California with the exception of a few individuals from Idaho. In his key besides the five new species he includes *E. alternata* and *E. shoshone*.

Unfortunately, the differentiating characters that Bliven used such as color and size are so variable that identification based on these features just leads to confusion. It has already been shown (Makhotin 1947; Vojdani 1954) that in *Eurygaster* homochromy and the protective coloration are common intraspecific variables. This is the reason why so many varieties have been described among the common Palearctic species (nine varieties for *E. maura*; eight for *E. austriaca*; six for *E. testudinaria* and more than six for *E. integriceps*) (Peneau 1911, Wagner 1951). Also the size of *Eurygaster* individuals, like many other insects, is very variable

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being influenced particularly by quantity and quality of the food ingested by the immature stages, *e.g.*, the lengths of *E. austriaca* 11–16 mm., *E. maura* 8–11 mm., *E. hottentata* 11–14 mm.

The relatively small number of specimens examined by Bliven, a total of 50 specimens for five species collected in five or six localities (a species for each locality), does not provide a sound basis for species characterization when based on size and color alone. Furthermore, it is evident from the key characters and illustrations used by Bliven that he had misidentified *E. shoshone* and probably *E. alternata*.

Some 700 specimens collected from many localities in California particularly in northern counties (fig. 7) and some from other western states were studied to determine the extent of the intraspecific variability.

In this series it was suspected that not only were the well known species *E. alternata* and *E. shoshone* represented but also all of Bliven's so-called species. Since an effort to separate Bliven's species from one another failed when color and size alone were used it was decided to compare the genitalia of both sexes of all individuals in the series under study. The use of these latter structures have successfully resolved the species complex in the old world (see Wagner 1951 or Vojdani 1954).

The genitalic differences found in the study series permitted segregation of four groups of specimens, and it was concluded that each of the following groups represented a species.

Group 1.=*E. alternata* Say (figs. 1 and 2)

Group 2.=*E. shoshone* Kirkaldy (figs. 1 and 2)

Group 3.=*E. sp. C* (figs. 1 and 3)

Group 4.=*E. sp. D* (figs. 1 and 3)

Groups 1 and 2 seem to fit the concepts of the two well known species *E. alternata* and *E. shoshone*, but what specific names to apply the groups 3 and 4 posed another problem, for there were five Bliven names available.

To determine where Bliven's "species" fall within the four distinct groups (species) based on genitalic differences, the only characters in Bliven's descriptions that possibly could be used were size proportions. Therefore measurements of length of body, width of abdomen and also width of thorax, the latter not included by Bliven, were made on 40 individuals of group 3 and of group 4 as well as 20 individuals of *E. alternata* and *E. shoshone*. All

individuals were randomly selected and the data were analyzed statistically. The results of this analysis are shown in Table 1 and Figures 4, 5, and 6.

The data shown in Table 1 and Figures 4 and 5 indicate clearly that the lengths and widths of four of Bliven's species, viz., *E. greggii*, *E. macclellani*, *E. ukiah* and *E. amerinda*, were not significantly different and agree with the species group 3 designated above as *E. sp. C.*, and Bliven's species *E. minidoka*

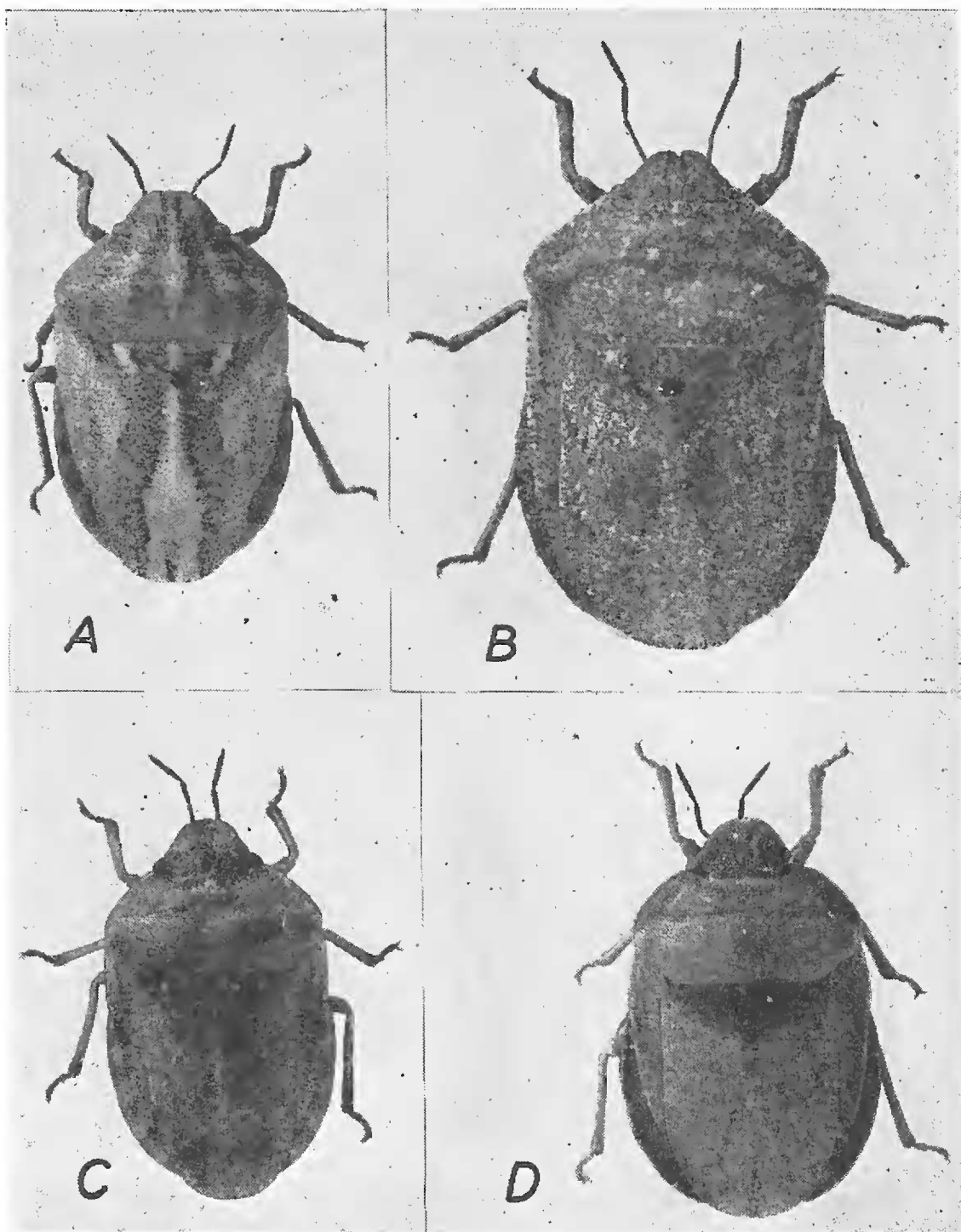


Fig. 1—General aspect of four Nearctic species of *Eurygaster*. A: *E. alternata* Say, B: *E. shoshone* Kirkaldy, C: *E. minidoka* Bliven, D: *E. amerinda* Bliven.

corresponds with the proportions of species group 4 or *E. sp. D*. The data shown in Table 1 and Figure 6 indicate that the width of the thorax is less variable than the width of the abdomen and not only supports the segregation of the above populations, but is perhaps a more useful character for the separation of these species.

It is clear that the variability of size between the sexes distinctly overlaps; therefore size cannot be used to separate sexes as Bliven believed. The structure of the last abdominal segment is the only conspicuous and reliable character for sex determination.

Therefore on the basis of genitalia and statistical analysis of

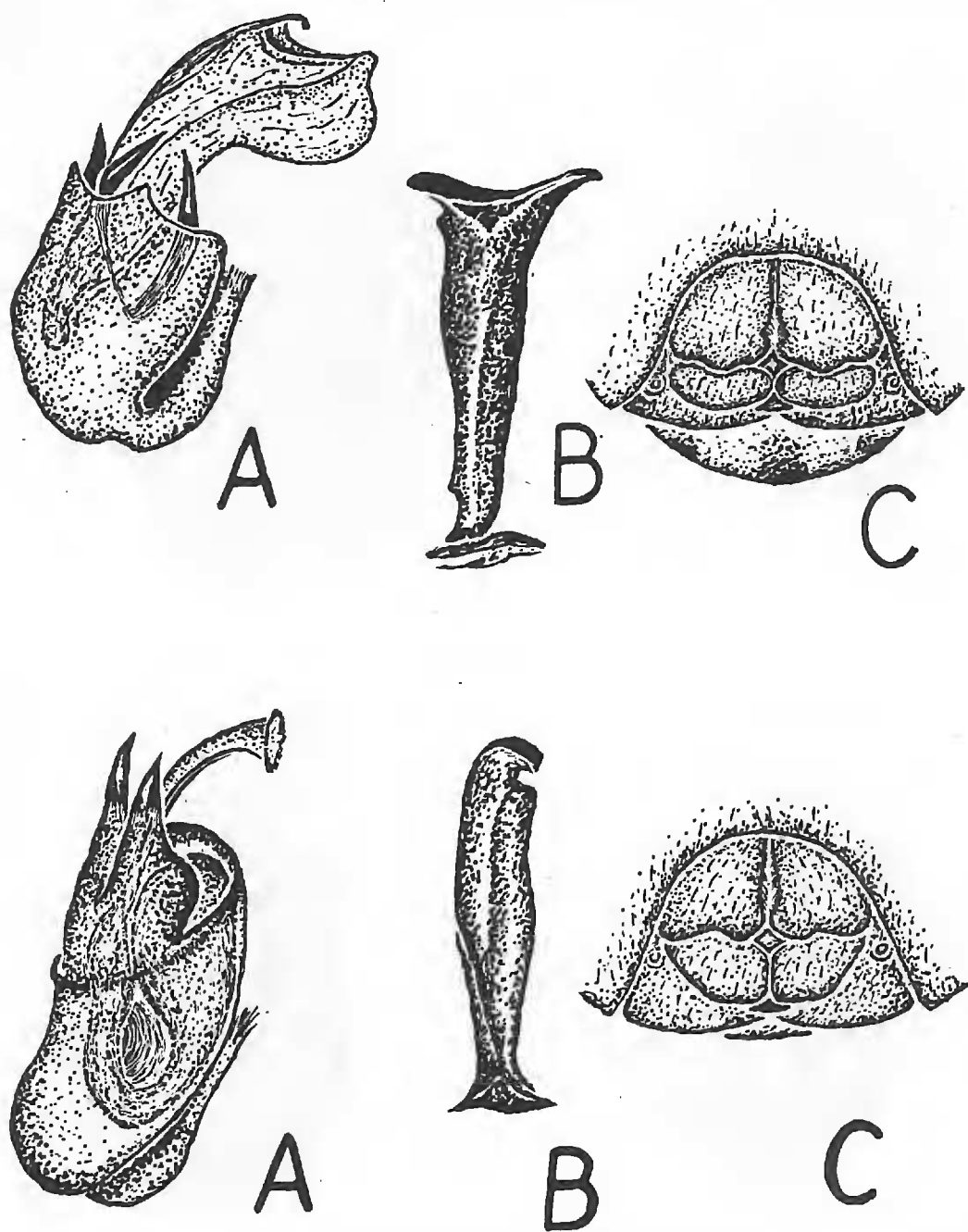


Fig. 2—Upper: *Eurygaster alternata* Say. Lower: *Eurygaster shoshone* Kirkaldy. A. ♂ Genitalia; B. ♂ Paramere; C. ♀ Genitalia.

size variability the following species of the genus *Eurygaster* occur in the Nearctic region with the new synonymy as indicated.

1. *E. alternata* Say
2. *E. shoshone* Kirkaldy
3. *E. amerinda* Bliven = *E. greggii* Bliven, *E. maclellani* Bliven, *E. ukiah* Bliven (new synonymy)
4. *E. minidoka* Bliven

Distribution. The insufficient information available at the present time permits only a sketchy outline of the distribution of the genus *Eurygaster* in the United States. The general picture however, indicates that they are fairly widespread. These bugs are

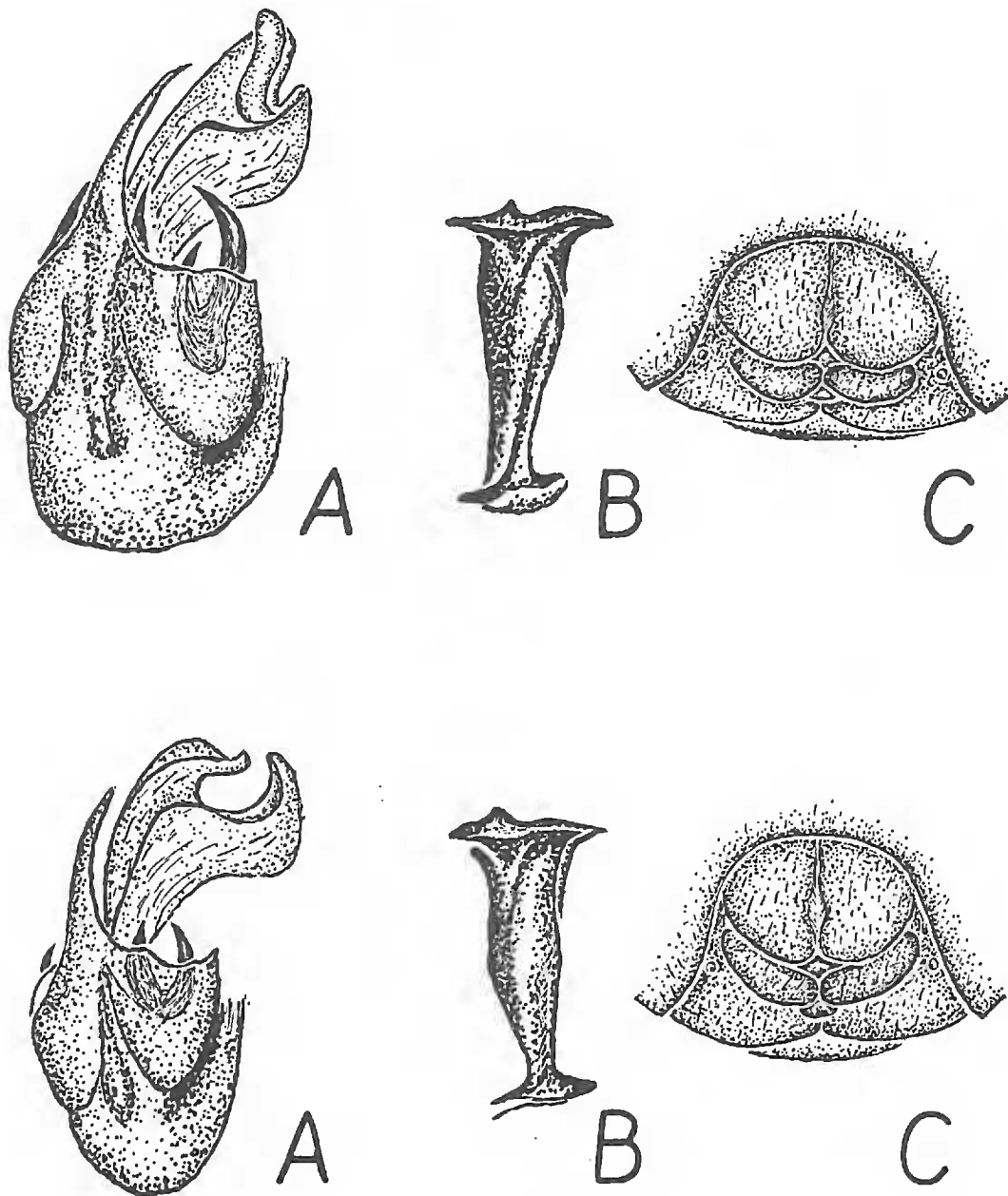


Fig. 3—Upper: *Eurygaster amerinda* Bliven. Lower: *Eurygaster minidoka* Bliven. A. ♂ Genitalia; B. ♂ Paramere; C. ♀ Genitalia.

Table 1.—Size Comparison of Four Nearctic Species of *Eurygaster* in Millimeters

SPECIES GROUP	N	LENGTH		WIDTH AT ABDOMEN		WIDTH AT THORAX	
		Range	Mean	S. D.	Range	Mean	S. D.
Group 1 (<i>E. alternata</i>)	20	7.3-9.0	8.3	±0.49	4.2-5.3	4.8	±0.31
Group 2 (<i>E. shoshone</i>)	20	10.0-11.8	11.3	±0.42	6.4-7.2	6.8	±0.23
Group 3 (<i>E. sp. C</i>)	40	8.5-9.7	9.1	±0.34	5.6-6.4	6.0	±0.21
Group 4 (<i>E. sp. D</i>)	40	7.5-9.1	8.6	±0.36	4.5-5.5	5.2	±0.22

5.0

4.3-5.3

5.7

±0.19

associated with savanna grasslands in the mountainous ranges regardless of the altitude.

The present state records of the two earlier known species show that *E. alternata* is distributed transcontinentally chiefly across the northern part of the United States with extensions to Canada and New Mexico. This area represented by records from east to west includes Maine, New Hampshire, Massachusetts, New Jersey, New York, Michigan, Illinois, Indiana, Iowa, North

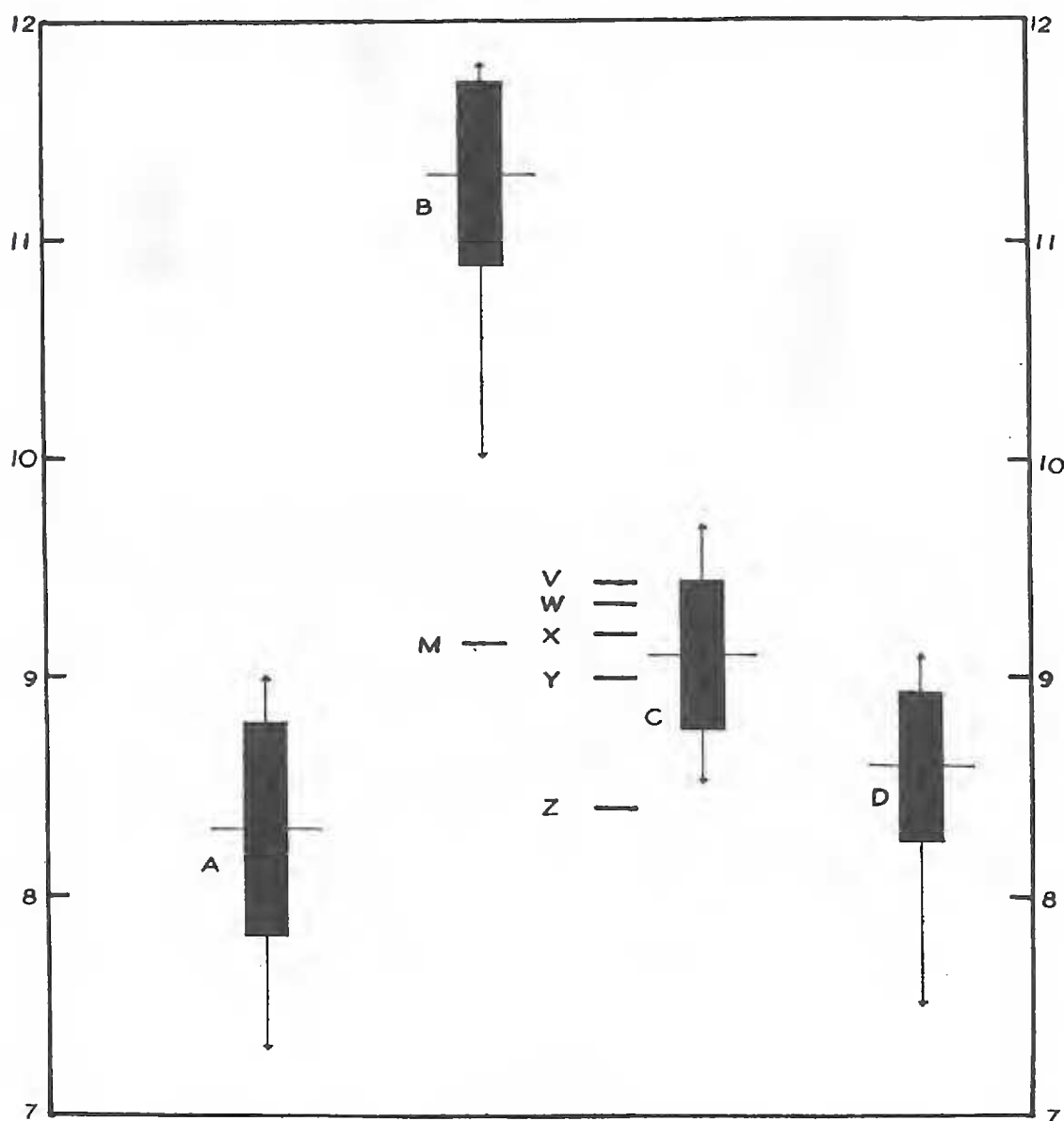


Fig. 4—Diagram showing the variability of the body length of four groups of species of *Eurygaster* compared with Bliven's species: A: *E. alternata*; B: *E. shoshone*; C: *E. sp. C* (= *E. amerinda*); D: *E. sp. D* (= *E. minidoka*); V: *E. amerinda*; W: *E. maclellani*; X: *E. greggii*; Y: *E. ukiah*; M: Mean of V.W.X.Y.; Z: *E. minidoka*. In each species the vertical line indicates the total observed variations; the broad portion of line one standard deviation of each side of the mean.

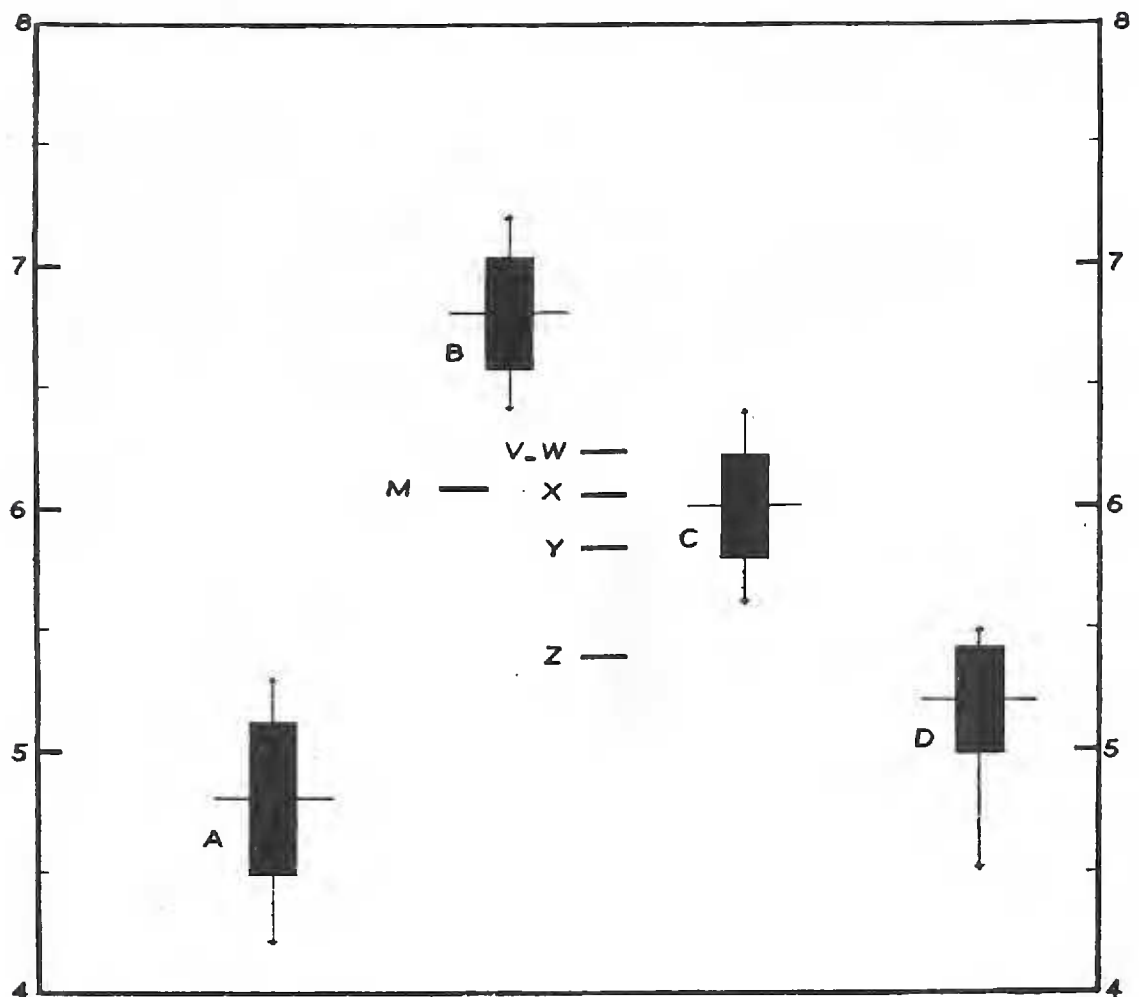


Fig. 5—Diagram showing the variability of the abdominal width of four groups of species of *Eurygaster*. (Letters and explanation as in figure 4.)

Dakota, Nebraska, Montana, Colorado, New Mexico, Utah, Nevada, and California (figure 7).

In California, *E. alternata* is relatively scarce in collections as compared to the other species. This species occurs in the northern boreal areas of the state, viz., Eagle Creek, Trinity County, Castella, Shasta County, and in the Sierra Nevada mountains, Sattley, Sierra County, Hobart Mills (Sagehen), Nevada County (figure 7).

During the past 50 years *E. shoshone* has been reported only from the western states. This western species occurs from Washington to southern California with Utah as the eastern limit. *E. shoshone* has been collected in Washington, Oregon, California, Nevada, Idaho and Utah, and is fairly rare in collections.

The available records for California show that this species tends to occupy the southcentral part of the state, particularly on the slopes of the mountains surrounding the San Joaquin Valley

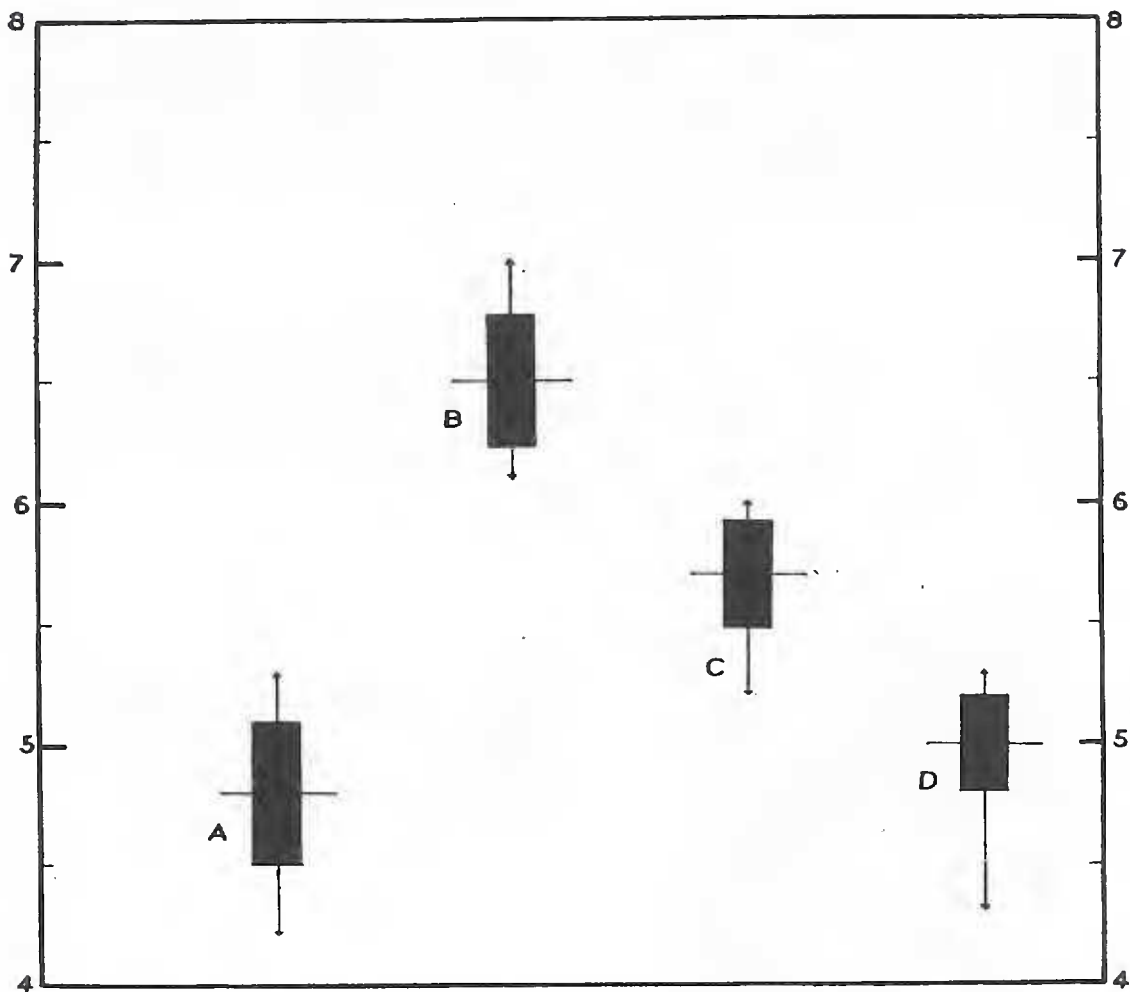


Fig. 6—Diagram showing the variability of the thoracic width of four groups of species of *Eurygaster*. (Letters and explanation as in figure 4.)

(figure 7). The following are available locality records: Randsburg, Kern County; Arvinwood Lake and Ash Mt. flume in the Sequoia National Park, Tulare County; Mt. Hamilton and Pacheco Pass in Santa Clara County; Moor Park, Ventura County; Mint Canyon and Claremont in Los Angeles County; and Panamint, Inyo County.

E. minidoka is the most common species in California, and it also has been collected in Washington, Oregon, Idaho, Nevada and Utah (figure 7). In California this species is widespread, but is found mainly in the major mountain ranges of northern and central parts of the State (figure 7).

E. amerinda is also a common species in California but has not been collected outside of this state. It is found associated with *E. minidoka* in most localities except in the San Francisco Bay Region. Here *E. amerinda* is apparently the only *Eurygaster* species represented (figure 7).

E. minidoka and perhaps *E. amerinda* will be found to have a wider distribution when further study is made of eastern specimens considering the genitalia and other specific characters. Since *E. minidoka* superficially resembles *E. alternata*, the former species may be misidentified in eastern collections.

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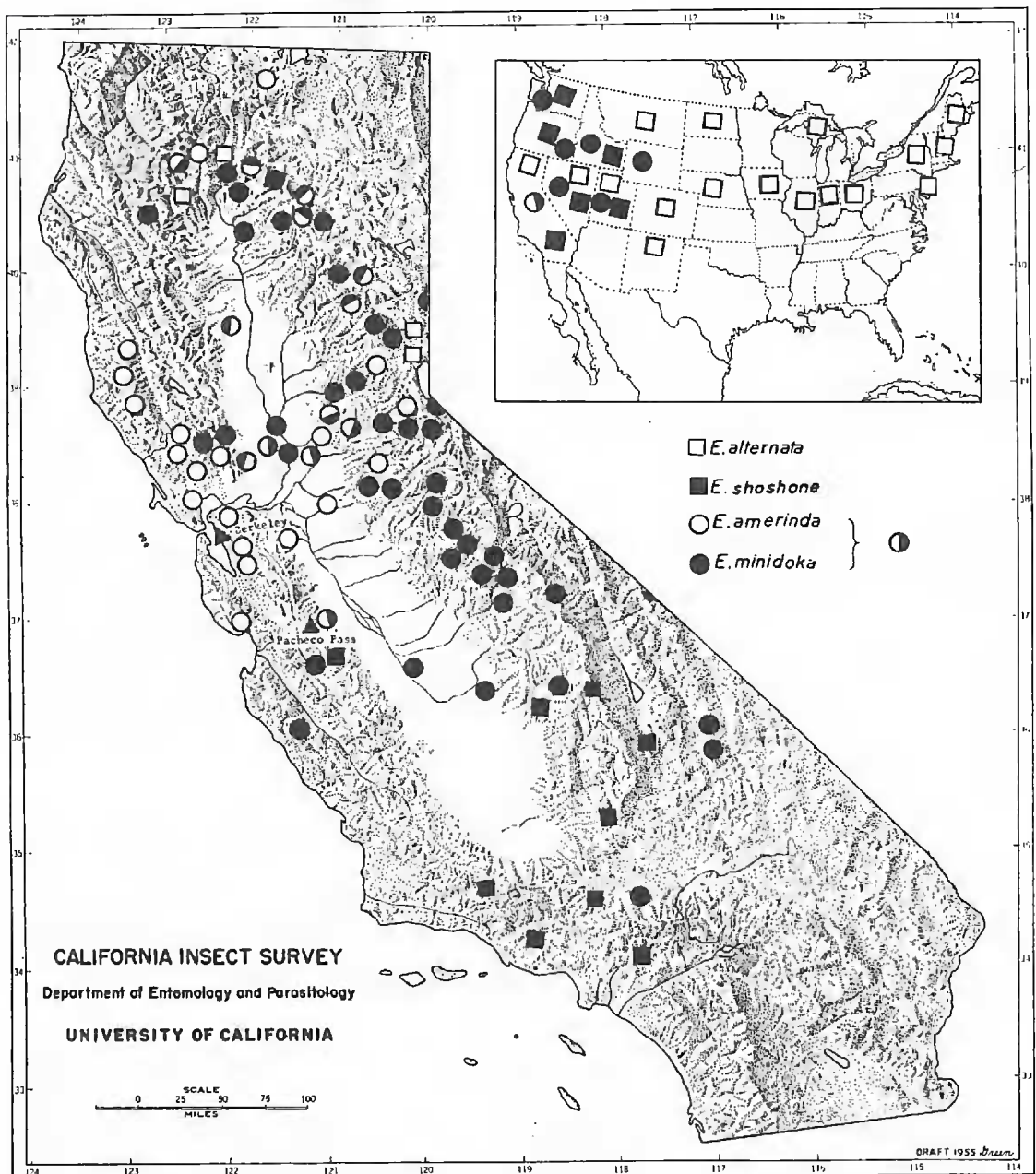


Fig. 7—Distribution of *Eurygaster* recorded up to the present time in the U.S.A. in general and in California specifically.

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